COMPARING THE PERFORMANCE OF DIFFERENT THERMOPLASTIC MATRIX PRE-IMPREGNATED MATERIALS

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Abstract

The aim of the present work is comparing the performance of different available thermoplastic pre-impregnated raw-materials produced by different methods.
In the last years, thermoplastic replaced with success thermosetting as matrices of long/continuous fiber reinforced composites due to the numerous advantages they present. However, it remains a challenge developing technologies to wet and impregnate fibers with thermoplastic matrices, characterized for being much more viscous than thermosets [1, 2].
Today, two major technologies are being used to wet reinforcing fibers with thermoplastic polymers [1, 2]: i) the direct melting of the polymer and, ii) the intimate fiber/matrix contact prior to final composite fabrication. Continuous fiber reinforced thermoplastic matrix pre-impregnated tapes are, for example, produced by direct melting processes. Alternatively, intimate contact processes allow producing cheap and promising pre-impregnated materials, such as, commingled fibers, co-woven fabrics and towpregs.
This work studies and compares the processability into final composite parts of three different pre-impregnated materials, produced by both of the above mentioned wetting techniques,. All studied pre-impregnated materials were based on a continuous glass fibers reinforced polypropylene matrix (GF/PP) system. One is a tape produced in a previous work [3] by the melting process (cross-head extrusion) and, from the other two produced by fiber/matrix intimate contact methods, one is a commercial available commingled fibers product and the other a towpreg produced by our own developed dry coating prototype line [4]. Pultrusion and compression molding were the manufacturing methods selected to process all the pre-impregnated materials into final composite parts.
The performance of the three studied GF/PP pre-impregnated materials was assessed by comparing final properties of the manufactured composite parts submitted to mechanical testing and microscopy analysis.

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